Getting Technical with TV&C...

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Multiple Choice Exams

Introduction

This monograph will provide a general introduction and brief overview of some of the principles underlying the development and use of multiple choice job knowledge exams. Job knowledge exams are typically included under a broader umbrella of assessment techniques referred to as cognitive ability tests. Measures of cognitive ability allow a person to demonstrate what he or she knows, perceives, remembers, or understands.

Advantages and Disadvantages of Multiple Choice Exams

The multiple choice exam format offers several advantages in comparison to other testing formats. However, there are also disadvantages inherent to this testing approach. These advantages and disadvantages should be given appropriate consideration when determining whether a multiple choice exam is a suitable assessment technique given the knowledge, skills, and abilities (KSAs) to be tested.

Properly developed and administered multiple choice job knowledge exams have several advantages over alternative assessment techniques. Multiple choice job knowledge exams:

- permit testing at a variety of levels of cognitive functioning, from simple recognition to the analysis of problems and evaluation of solutions;
- allow for wider sampling of relevant content than is possible with a free-response format (e.g., essay test, interview), thereby providing a more comprehensive assessment of the content domains of interest;
- are objectively scored, generally resulting in higher reliability than other testing formats; and,
- can be scored in a relatively efficient and inexpensive manner when scannable answer forms are used, or when administered and scored via a computer.

As with other assessment techniques, there are also disadvantages associated with multiple choice job knowledge exams. These disadvantages include the fact that multiple choice exams:

- may merely require recognition as opposed to the application of a theory or principle (although this is often the fault of the item writer and is not necessarily inherent in the test format);

- do not allow for the expression of creativity or the assessment of originality; and,

- may result in adverse impact against members of protected groups.

Job Analysis

A job analysis for the job classification for which the multiple choice job knowledge exam will be used should be conducted prior to beginning the exam development process. Through the job analysis, the essential tasks or functions of the job can be identified, as well as the accompanying knowledge, skills, and abilities (KSAs).

Because multiple choice job knowledge exams focus on the cognitive aspects of job performance, there are several questions that should be addressed in determining which of the KSAs identified through the job analysis may be appropriate, feasible, and practical to assess with this testing format. Questions to be addressed include:

- Is this KSA needed upon entry to the job, or will training be provided on this KSA? If the KSA is needed upon entry, does this KSA link back to at least one essential task or function of the job?

- Is this KSA needed for performance of important job tasks?

- Can this KSA be adequately assessed using a multiple choice job knowledge exam?

Upon the identification of important KSAs that will be assessed with a multiple choice job knowledge exam, the development of exam content can commence.

Sources of Information

Content for multiple choice job knowledge exam items can be derived from a variety of sources. The primary source for item content may be subject matter experts (SMEs) who are both knowledgeable of the job classification for which the exam is being developed, as well as the subject matter to be assessed. The SMEs within this context generally include incumbents in the target job classification and supervisors of those incumbents.

The involvement of SMEs in the exam development process may range from providing input on item content to actually drafting complete multiple choice items. It is important to remember, however, that SMEs are not item writing experts. The SMEs are experts on the content to be assessed, as opposed to the principles of item construction. Consequently, guidance and training should be provided to the SMEs prior to having them develop items.

Because SMEs are not well versed in item construction, some of the items they prepare may be inadequate or unusable. For this reason it is advisable to have the SMEs prepare more items than will ultimately be needed for a given section of the exam. All items that are prepared by SMEs should be closely reviewed by the exam analyst to ensure that they conform to the principles of properly developed multiple choice items.

Many, if not all, of the items developed by SMEs will require some editing or revision before the exam can be finalized.

Although input from SMEs may be a primary source of information for multiple choice item content, existing source documents which address the intended subject matter may also prove to be valuable resources. Examples of such source documents include procedure manuals, training materials, code or statute books, desk procedures, and text books. When using source documents for item content, it is important that the resulting items assess the requisite body of knowledge at the level that is appropriate given the requirements of the target job classification.

Item Construction

A multiple choice item consists of three elements: the stem, the key, and the distracters. Although a comprehensive discussion of these three elements is beyond the scope of this monograph, each of the elements, as well as the item as a whole, will be briefly described.

The Stem. The purpose of the stem in a multiple choice item is to acquaint the examinee with the question that is being asked or the problem that is being posed. The stem should be expressed in a manner that elicits the essential knowledge being assessed as directly as possible. The stem should also be able to stand on its own. In other words, the stem should not consist solely of a phrase or statement followed by a series of alternatives. After reading the stem, the examinee should have a complete understanding of the question or problem presented. If the examinee must read the item response options to clarify the intended question or problem, the stem is inadequate.

The Key. The key is the correct answer to a multiple choice item. A dichotomously scored multiple choice item should have only one key. That key should be the *only* correct answer, or definitely *the best* answer among the alternatives. If the key is the best answer, the stem should include a qualifying or limiting phrase which indicates to the examinee that the best answer should be identified (e.g., "which of the following is the best . . ."). The key generally should not be the *best* answer when a correct answer to the same question is available, however.

The Distracters. The distracters in a multiple choice item are the incorrect responses to the question that is being asked or the problem that is being posed. The purpose of a distracter is to discriminate between examinees who possess the specific body of knowledge being assessed by the item, and those who do not possess such knowledge. In order to properly discriminate, each distracter must clearly be an incorrect response to the stated question or problem, as well as be a plausible option to the examinee who lacks a knowledge of the subject matter.

The strength of a multiple choice item is dependent upon the plausibility of the distracters. Consequently, no distracter should be so obviously incorrect that it will be avoided by all examinees, whether they possess a knowledge of the subject matter or not. Such distracters diminish the discriminability of the item and increase the item's chance score.

The Item as a Whole. In addition to the principles that apply to each of the three elements (i.e., stem, key, distracters) of a multiple choice item, there are also developmental principles that apply to the item as a whole. Each item within a multiple choice exam should assess an important body

of knowledge at a level that is appropriate for the intended use of the exam. In the case of a job knowledge exam, each item should assess a level of knowledge that is expected upon appointment to the job and is needed for the performance of important job tasks.

Assembling the Exam

Once the multiple choice items have been developed, they can be assembled and formatted in a psychometrically sound manner to create an effective exam. Often times a multiple choice exam will assess several different bodies of knowledge. When this is the case, exam items assessing each particular knowledge should be grouped together to form subtests or segments. The number of segments comprising the exam will typically be equivalent to the number of knowledge domains assessed by the exam.

Each segment within an exam will consist of a homogeneous set of items generally assessing one specific knowledge. Homogeneity is based on the premise that items within a measure are useful only to the extent that they assess the same underlying body of knowledge. When this is, in fact, true, the average correlation among items within the segment is high, as is the average correlation of items with total score. Consequently, when assembling an exam, it is necessary to group similar items together to achieve segments of homogeneous content.

In addition to creating segments of homogeneous content, it is also necessary for these segments to contain a sufficient number of items to adequately assess the domain of interest. A sufficient number of items within a segment is needed to ensure that the segment provides a reliable measure of the particular knowledge being assessed. Usually 30 dichotomous items within a segment are needed to obtain an internal consistency reliability coefficient of .80. As the number of items within a segment decreases, the reliability of that segment diminishes. Therefore, as a rule of thumb, it is recommended that 30 items be considered as the lower bound for an exam segment.

Conclusion

A properly constructed multiple choice exam can provide a very good measure of the cognitive aspects of job performance. By adhering to multiple choice exam development principles and professional standards in assessing important job knowledge, a valid and reliable predictor of job success can be achieved. This monograph has introduced some of the principles that are integral to the development of a multiple choice exam. A more comprehensive discussion of this topic can be found in textbooks devoted to educational measurement or industrial psychology.

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